

**What is claimed is:**

**CLAIMS**

- 1    1. An electrically continuous conformal EMI protective shield for adhering directly to and  
2 conforming with surfaces of a printed circuit board comprising:
  - 3        a thermally conductive dielectric coating adhering directly to surfaces of the printed
  - 4        circuit board to provide an electrically nonconductive, thermally conductive, contiguous layer
  - 5        over all such printed circuit board surfaces; and
  - 6        a conductive coating adhering directly to surfaces of the dielectric coating to provide an
  - 7        electrically conductive layer that prevents electromagnetic emissions from passing through
  - 8        the conformal EMI protective shield.
- 1    2. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric  
2 coating comprises one of the group consisting of boron nitride (BN), aluminum oxide ( $\text{AlO}_3$ )  
3 and magnesium oxide ( $\text{MgO}$ ).
- 1    3. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric  
2 coating is formed from a thermally conductive dielectric dispersion comprising:
  - 3        a base liquid;
  - 4        a binder material suspended in the base liquid; and
  - 5        a thermal loading material suspended in the base liquid.
- 1    4. The conformal EMI shield of claim 3,  
2        wherein the thermal loading material comprises one of the group consisting of boron  
3        nitride (BN), aluminum oxide ( $\text{AlO}_3$ ) and magnesium oxide ( $\text{MgO}$ ).
- 1    5. The conformal EMI shield of claim 3, wherein the binder material comprises one of the  
2        group consisting of acrylic and urethane.
- 1    6. The conformal EMI shield of claim 3, wherein the base liquid and binder material are  
2        provided in an intermediate dispersion subsequently doped with the thermal loading material.

- 1    7. The conformal EMI shield of claim 3, wherein the base liquid is one of either water or an  
2    organic solvent.
  
- 1    8. The conformal EMI shield of claim 3, wherein the thermal loading material is 10%-80%  
2    and the binder is 90%-20% by weight of the thermally conductive dielectric dispersion.
  
- 1    9. The conformal EMI shield of claim 3, wherein the thermal loading materials is a 0.1-10  
2    micron Boron Nitride powder.
  
- 1    10. The conformal EMI shield of claim 3, wherein the thermal loading materials is a 100  
2    mesh, 99% corundum, alpha-phase Aluminum Oxide powder.
  
- 1    11. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric  
2    coating has a viscosity of at least 45" #2 Zahn Cup (full body).
  
- 1    12. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric  
2    coating has a viscosity in the range of 50-100" #2 Zahn Cup (full body).
  
- 1    13. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric  
2    coating has an adhesion that enables it to pass the ASTM D-3359-83 Method A Tape Test  
3    using a 1" (25 mm wide) semi-transparent pressure-sensitive tape with an adhesion strength  
4    of 25-70 ounces per inch when tested in accordance with ASTM Test Method D-3330.
  
- 1    14. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric  
2    coating is 1.5-2.0 mils thick.
  
- 1    15. The conformal EMI shield of claim 1, wherein the thermally conductive dielectric  
2    coating is formed from multiple applications each forming a 1 mil thick layer of thermally  
3    conductive dielectric.

- 1        16. A printed circuit board (PCB) comprising:
  - 2            a printed wiring board;
  - 3            a plurality of components mounted on the printed wiring board; and
  - 4            a conformal coating secured to surfaces of at least a region of the PCB, comprising:
    - 5              a conductive coating, conformingly and adheringly disposed on the PCB
    - 6              surfaces, that prevents electromagnetic waves from passing therethrough; and
    - 7              a thermally conductive dielectric coating interposed between the conductive
    - 8              coating and predetermined portions of the PCB surfaces so as to completely insulate
    - 9              the predetermined PCB portions from current traveling through the conductive
    - 10             coating.
- 1        17. The printed circuit board of claim 16, wherein the thermally conductive dielectric coating comprises one of the group consisting of boron nitride (BN), aluminum oxide ( $\text{AlO}_3$ ) and magnesium oxide (MgO).
- 1        18. The printed circuit board of claim 16, wherein the thermally conductive dielectric coating is formed from a thermally conductive dielectric dispersion comprising:
  - 2              a base liquid comprising one of the group consisting of water and organic solvent;
  - 3              a binder material suspended in the base liquid that comprises one of the group consisting
  - 4              of acrylic and urethane; and
  - 5              a thermal loading material suspended in the base liquid that comprises one of the group
  - 6              consisting of boron nitride (BN), aluminum oxide ( $\text{AlO}_3$ ) and magnesium oxide (MgO).

- 1        19. A method for coating a printed circuit board comprising:
  - 2            providing a printed circuit board; and
  - 3            conformingly adhering to the printed circuit board a continuous conformal coating for
  - 4            providing a substantially EMI-impervious shield comprising,
    - 5            a thermally conductive dielectric coating adhering directly to surfaces of the printed
    - 6            circuit board to provide an electrically nonconductive, contiguous layer over all such
    - 7            printed circuit board surfaces; and
    - 8            a contiguous conductive coating adhering directly to surfaces of the dielectric
    - 9            coating to provide an electrically conductive layer that prevents electromagnetic
    - 10          emissions from passing through the conformal EMI protective shield.
- 1        20. The method of claim 19, wherein the thermally conductive dielectric coating comprises
  - 2            one of the group consisting of boron nitride (BN), aluminum oxide ( $\text{AlO}_3$ ) and magnesium
  - 3            oxide ( $\text{MgO}$ ).

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